Compatibility between Rolling Stock & Train Detection Systems: CENELEC and link to CCS TSI

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K aktuálním problémům zabezpečovací techniky v dopravě III
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Assigned Projects

**Pr15360**

Standardization of electromagnetic interference limits and test specifications for interoperable rolling stock to ensure compatibility with train detection equipment

- The limits and tests are being derived from the following types of train detection equipment
  - Track circuits
  - Axle counters
  - Treadles (wheel sensors) and loops

**Basis for the development and test of new rolling stock vehicles**
Assigned Projects

Pr16623

Standardization of the characteristics of train detection systems

- Definition of basic parameters to ensure the safe and reliable detection of rolling stock by
  - Track circuits (Shunt impedance ...)
  - Axle counters (Wheel dimensions ...)
  - Treadles (wheel sensors) and loops

Basis for the development and test of new train detection equipment
Basis for the harmonization of the limits and parameters

• Lists of the train detection equipment types used in Europe
  » Axle counters 20 types
  » Track circuits 80 types
  » Treadles and loops 15 types
  » All types classified according to country, application and preference for new applications

• National interference limits for existing track circuits
    » Tables of limits as a function of frequency and bandwidth for the various types
    » Test- und evaluation criteria for the rolling stock

• Nationale interference limits for axle counters, treadles and loops have in the past not been defined in the necessary detail.
  – The immunity tests are being established by WGA4-2
Strategy Pr15360

Electro-magnetic interference limits and test specifications for ensuring compatibility of interoperable rolling stock with train detection equipment

- Base the limits on a subset of the preferred types of existing train detection equipment
- The criteria for choosing the subset are:
  - Preferred types for future interoperable lines
  - State of the art in the countries actively participating in WGA4-2
- The resulting limits and test specifications will be standardized in supplementary parts to EN50238 for track circuits, axle counters and treadles.
• Scope of the standard for “Compatibility with Track Circuits”
  – Gabarits of limits of rail current for each traction voltage (DC, 16.7 Hz, 50 Hz)
  – Test and evaluation criteria for the rolling stock
    » Test procedure
    » Test cases
    » Summation rules
    » Pass/fail criteria (e. g. for exceedances of the limits)
• Scope of the standard “Compatibility with Axle Counters”
  – Limits of electromagnetic fields produced by vehicle mounted equipment and by rail current
  – Limits are specified as a function of
    » Direction of field
    » Duration of the interference
  – Test and evaluation criteria for the rolling stock
    » Test procedure
    » Test cases
    » Pass/fail criteria
Characteristics of Train Detection Systems

• Basic parameters to ensure the safe and reliable operation of train detection equipment

• Scope of characteristics of track circuits:
  – Minimum track circuit voltage between the rails
  – Maximum shunt
  – Min./max. ballast resistance
  – Reaction time to occupy and clear
  – Frequency management
  – Immunity requirements and safety margin
  – Test criteria for establishing the immunity
• Scope of “Characteristics of axle counters and treadles”:
  – Compatibility parameters for detecting wheels (wheel dimensions...)
  – Compatibility criteria for vehicle mounted magnetic brakes including their power supplies
    » Magnetic brakes
    » Eddy current brakes
  – Frequency management
  – Immunity requirements and reserves
    » Basic requirements
    » Interference suppression mechanisms
  – Test criteria for establishing the immunity
Organisation of the work

CENELEC SC9XA

Working Group WGA4-2
Experts from railways, signalling manufacturers and the rolling stock industry

Subgroup
Axle Counters & Treadles

Subgroup
Track Circuits

EU Research Project
„Railcom“

Participating Railways, Industry & Research Institutes

National Working Groups
Status pr15360 Track Circuits

- Initial harmonized gabarits for 3kV, 16.7 kV and 25 kV are available.

✓ Harmonized test methods for rolling stock are in preparation with support from the rolling stock industry and the Railcom project
  - Rules for transient exceedances of the gabarits are in preparation
  - Power network resonances are being researched within the Railcom project. The results may come too late for the standard.
Status pr15360 Axle Counters

- A standardized immunity testing method for axle counters has been adopted on the basis of methods developed in 2006 by the SBB.
- Several major axle counter manufacturers have now provided immunity initial limits based on the standardized method. Additional refinement is now being done on the basis of an initial review by WGA4-2.
- Optimization of the reference antenna used by SBB for measuring interference from the rolling stock is being carried out by WGA4-2 with support from the Swiss development team.
- The next main work package is to rationalize the immunity characteristics of the different axle counter equipments.
Schedule for pr15360

Schedule for EN50238-2 Compatibility with Track Circuits and EN50238-3 Compatibility with Axle Counters

- Collection and evaluation of information
  - Preparation of draft standard

2007

2008

2009

- Collection and evaluation of information
  - Preparation of draft standard

Symbols:

▲ SC9XA discussion

▲ Issue by secretary of SC9XA

06/08 Issue to Secretarial Enquiry (2 months)
09/08 Comments of NC
01/09 Issue to CENELEC Enquiry (5 months)
12/09 Issue for vote

Limits for treadles and loops will follow at a later date.
The situation with pr16623

- WGA4-2 is concentrating its resources on meeting the deadline 12/2009 for pr15360 for track circuits and axle counters. Basic parameters required for pr15360 will be harmonized as required within that project.
- Pr16623 will follow at a later date when experience with the acceptability of pr15360 has been made.
- Data for pr16623 is being collected during the on-going work for pr15360.
Other compatibility issues – Magnetic brakes

Compatibility of vehicle magnetic brakes with axle counters

• General compatibility criteria can be defined.
• Specific compatibility case will be required due to the complexity caused by the combination of several simultaneous influences of the brakes on axle counter sensors
  – Influence of the mass of metal (related to the metal-free area defined in EN50238 and the TSI)
  – Coupling between the coils of the brake and the coils of the axle counter sensor
  – Electromagnetic interference generated by both the brake and the power supply of the brake

✓ The working group “CEN/TC 256/SC3/WG 22 TF Electro-Magnetic Track Brakes” is currently defining the functional and performance criteria for magnetic brakes.
Other compatibility issues – Trackside cables

Interference in trackside cables induced by traction current

- Psophometric interference limits are different in each country
- The criteria leading to their definition are no longer known
- The psophometric weighting factor is neither a suitable criteria for modern transmission systems nor for transmission of signalling information.
- WGA4-2 organised a meeting on this subject to discuss the present situation. A report is available.
- The UNIFE EMC subgroup has prepared a statement on the subject based on the results of the WGA4-2 meeting.
Other compatibility issues – TSI CCS

Several open points in the TSI CCS Annex A1 require investigation and closure:

✓ Sanding and contamination of the rails by composite brake blocks
  • Subject for UIC?
✓ Lack of compatibility of certain axle counter types with vehicle mounted magnetic brakes are a source of restrictive mechanical arrangements
  • Subject for CENELEC pr16623
✓ The axle impedance values are different in each current and require harmonization
  • Subject for CENELEC pr16623
Thank you for listening!

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